

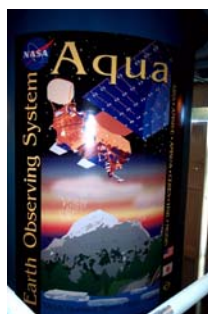


A FLIGHT PROGRAMS AND PROJECTS DIRECTORATE QUARTERLY PUBLICATION
A Newsletter Published for Code 400 Employees

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AQUA: IN ORBIT AND READY FOR THE SCIENTISTS

After over a decade of development, the Aqua spacecraft was finally launched on May 4, 2002, from Vandenberg Air Force Base in California.



Dozens of Code 400 personnel were critical to its success; and now, as many of them move on to other projects, the core of the Aqua work passes to mission operations, data handlers, and scientists. This article presents an overview of the Aqua mission from the science perspective, emphasizing the Earth-observing instruments and science teams to the exclusion of the equally fascinating and numerous additional aspects of the mission.

(Aqua Continued on page 4)

NOAA-M LAUNCH

- Dedicated to Harry McCain -

NOAA-M was launched at 2:23 PM EDT on June 24, 2002, on a U S. Air Force Titan II from Vandenberg Air Force Base (VAFB), California. The satellite was manufactured by Lockheed Martin Space Systems Company, Sunnyvale CA and instruments were provided by ITT (Advanced Very High Resolution Radiometer (AVHRR), High Resolution Infrared Radiation Sounder); Northrop Grumman (Advanced Microwave Sounding Unit-A); Ball Aerospace (Solar Backscatter Ultra Violet Spectrometer),

(NOAA-M Continued on page 8)

A MESSAGE FROM THE DIRECTOR OF

Congratulations to the POES team for the successful launch of NOAA-M. Under Karen Halterman's capable leadership, the spacecraft was brought to readiness and launched smoothly. The checkout period was just completed. My thanks to all of you, and best wishes as you move toward the next POES mission.

The reorganization of STACC is complete. Please join me in welcoming two offices to the Directorate: the Earth Sciences Technology Office (ESTO) and the Aerospace Technology Office (ATO). These are led by George Komar and Paul Mexcur, respectively. We welcome you and your teams to Code 400.

What's New in the Directorate:

New from STAAC:

Level 2 Technology Management Program Office, Code 404. The Technology Management Program Office manages and integrates Agency-level technology programs for NASA Headquarters. This office enables technologies to revolutionize NASA's future. It identifies advanced concepts and innovative systems architectures. It also seeks to foster breakthrough technologies and provides leadership in integrated technology planning, development, and infusion. The Technology Management Program Office also oversees integration of cross-Directorate technology activities

The Earth Science Technology Office (ESTO), Code 407, has the responsibility for integrating Earth Science Enterprise (ESE) technology development programs into a single comprehensive program for the Enterprise, to effectively address Earth systems science questions in the near-mid-far future, and to help stimulate new technology driven science programs necessary to meet future ESE goals. Mr. George Komar is the Program Manager/Chief of this office.

The Aerospace Technology Office (ATO), Code 408, manages a number of Agency-level programs and tasks for the Headquarters Office of Aerospace Technology. These activities currently include; SBIR/STTR NASA Program Management Office, NASA Institute for Advanced Concepts, and the NASA Technology Inventory. Mr. W. Paul Mexcur is the Program Manager/Chief of this office.

Code 400 Reorganizations:

The Rapid Spacecraft Development Project Office (Code 406), is now under the Earth Explorer's Program Office, and its new Code is 473. Greg Smith is the Project Manager/Office Chief.

The Associate Director Business Management Office, formerly STAAC Business Management Office (400.1), will be supporting the Center Associate Director.

Sun-Earth Connection Program Office, (Code 460). The Associate Director/Program Manager is Mr. Gil Colon and Ms. Linda Greenslade is the Program Business Manager;

Solar Terrestrial Probes (STP) Program Office, Code 461, Don Carson - Program Manager; Living with a Star, (LWS), Code 462, Gil Colon, acting Program Manager;

STP Missions in formulation and pre-formulation: Magnetospheric MultiScale (MMS); Geospace Electrodynamics Connections (GEC); Magnetic Constellation (MC)

(What's New in the Directorate Continued on page 14)



PERSONALITY TINTYPES



Phil Liebrecht

Phil Liebrecht has been the Program Manager of the Mission Services Program (MSP), Code 450, since the Project Goddard reorganization was implemented in 1997. Current Projects in the MSP include the Space Network Project, the Ground Network Project and the TDRS H,I,J Project. The Program also maintains a Customer Commitment Office and is the home of the Goddard Space Flight Center Spectrum Manager where the spectrum management responsibility for all of the GSFC missions falls. Additionally, the MSP is preparing to start a TDRS follow on formulation study in the FY 03 timeframe. The primary mission of the MSP is to provide products and services to support the space communications and operations needs of numerous space missions. Customers of the MSP include most of the GSFC flight missions, NASA enterprises and many external (reimbursable) space faring organizations.



Born: Washington D.C.

Education: B.S. and M.S degrees in Electrical Engineering from the University of Maryland On Family:

Phil and his wife Carmen reside near Burtonsville Maryland and have two daughters. Carmen grew up and was educated in Spain as a physicist and currently works on scientific software supporting various space science missions. Alma, age 18 graduated from Paint Branch High School in June and will be a French Horn Performance Major at the Curtis Institute of Music in Philadelphia this September. She is spending the summer touring Central and South America with the Youth Orchestra of the Americas and having a great time. Amanda, age 13 is an 8th grader in the math and science magnet program at Takoma Park Middle School. She just finished two wonderful weeks of volunteer work at the Brighton Woods Girl Scout camp and a week at the University of Maryland Science Camp near Cambridge Md. (What do you do at sci-

(Tintype Continued on page 12)

Dorene Honeycutt

This tin type is going to be a little bit different, as I choose not to be told in 3rd person. I am Dorene Honeycutt, the Administrative Officer for the Flight Programs and Projects Directorate. That is a true statement, but in addition to that comment, I want to share who I really am with all of you. I have this HUGE capacity to love, to open my heart to others and to accept others for who they are, and an unimaginable belief in the innate goodness in everyone.



Among other things, I am the power and strength in vulnerability. Vulnerability to me means that we're all going to fail or look bad, but we're going to be able to access the success in that failure to continue to take risks and grow from that experience. I know in this business, failure doesn't always seem an option, but in life, it's a reality. I learned this about myself over the past 5 months taking co-active coaching classes on my way to becoming a powerful coach for others, and really owning that power in myself. It hasn't been easy, and there are days I tend to hide it, but I know it to be true for me. In owning that power, I want to share parts of my life with you, parts of the whole. I want to open myself up to be ridiculed or judged, if that is what you feel you want to do; open myself up to be totally and completely honest with you and hope that, in my vulnerability, you will find the courage and strength to stand up for what you believe in or want in your own life, both professionally and personally.

The preliminaries:

I was born in Ft. Knox, KY, lived in Ethiopia for 3 years as a young child and then was raised in Arlington, VA. Gosh I'm sounding like cattle, I was raised...actually, I started my growing process in Arlington, VA, and have continued in that growth in various

(Tintype Continued on page 12)

FEEDBACK

GSFC Resident Office at KSC

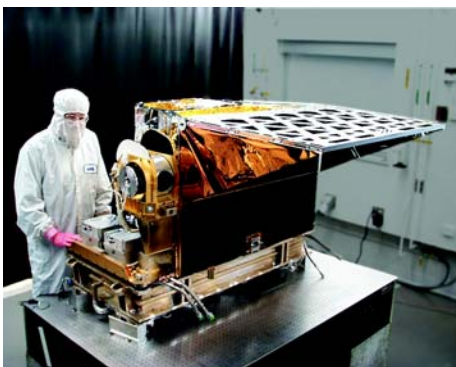
- Many activities are being planned for a yearlong 40th anniversary celebration at Kennedy Space Center (KSC). Dr. Kenneth Lipartito and Dr. Orville Butler, two historians and authors, have been commissioned to write the history of KSC. The new text will be the first major work to document the Center's history since 1976. The report will cover the Launch Operations Center (LOC) which was formed in 1962, the renaming of the Center to John F. Kennedy Space Center (November 1963) 7 days after the president was assassinated, and continuing through to today.
- All GSFC Projects must check with the Resident Office before traveling to KSC/CCAFS to avoid delays at the security gates. KSC security classification remains at security level Bravo. "Gate Badges" requested for payload processing team members will be issued at Pass and I.D. Gates 1 and 3. "Pass and I. D." and the Visitor Record Center (VRC) have initiated new requirements for badging. Recently the VRC was directly connected to the PM50 Master Training Record (all of KSC training records). The VRC verifies an individual's training record is current, as well as the Personal Liability Program (PRP) being up to date before issuing a badge. Unescorted access is determined by active or expired PRP and Safety training on file.
- Launch of Columbia (STS-107) with a Spacehab research module and Fast Reaction Experiments Enabling Science Technology Applications and Research (FREESTAR) micro gravity payload is under review. FREESTAR has six separate experiments: MEIDEX; SOLCON-3; SOLSE-2; CVX-2; LPT, and SEM. FREESTAR was processed and loaded into the Orbiter ready for launch when cracks were discovered in the hydrogen fuel liners in the orbiters. The delay of STS-107 and an August flight to the space station by Atlantis are on hold until the problem is resolved. Engineers and other experts are working together analyzing data to uncover a solution that will refurbish the liners.
- Kris Nighswonger and Mary Halverstadt received awards for their contributions resulting in the success of the Lightweight MPES Carrier (LMC) mission, which flew aboard the space shuttle Endeavour on STS-108. Michael S. Pryby, Deputy, LMC Mission Manager presented the awards.
- Two Goddard Space Flight Center payloads launched from Vandenberg, AQUA (May 4) and NOAA-M (June 24), are successfully collecting data. AQUA is part of NASA's Earth Science Enterprise that globally maps sea-surfacing temperatures. NOAA-M is a polar orbiting satellite that will improve weather forecasting and monitor environmental events around the world.

Mary Halverstadt

(Aqua Continued from page 1)

Aqua carries six distinct Earth-observing instruments, all placed on board the spacecraft in order to help scientists examine and further understand the Earth's global climate system. As the name suggests, the Aqua mission has a particular concentration on water, with Aqua scientists examining ocean surface water, evaporation from the oceans, water vapor in the atmosphere, clouds, precipitation, soil moisture, snow cover and glacial ice on land, and sea ice in the oceans. In addition to water in all its forms, scientists are also analyzing Aqua data for information on vegetation, ocean productivity, trace gases and aerosols in the atmosphere, and other elements of the Earth's climate system.

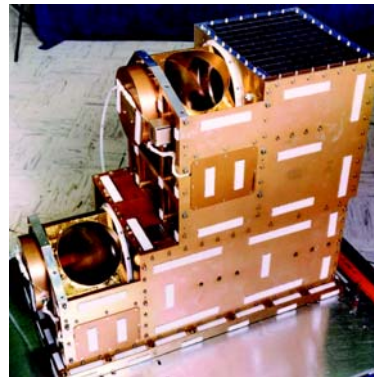
AIRS/AMSU/HSB



AIRS. (Photo courtesy of BAE Systems.)

Of the six Aqua instruments, the one with the greatest technological advances made as part of the Aqua program is the Atmospheric Infrared

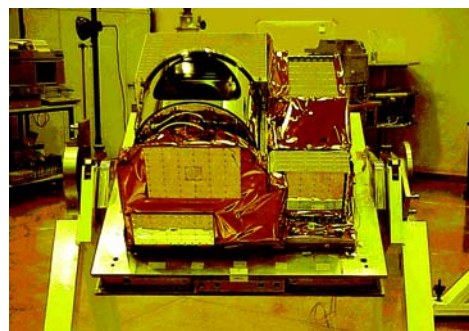
Sounder (AIRS). AIRS is a high-resolution sounder with 2378 channels measuring infrared radiation at wavelengths in the range 3.74-15.4 μm and four channels measuring visible/near-infrared radiation at wavelengths in the range 0.4-1.1 μm .



AMSU-A1. (Photo courtesy of Aerojet.)

AIRS is joined on Aqua by two microwave sounders: a 15-channel Advanced Microwave Sounding Unit (AMSU, consisting of two separate units, AMSU-A1 and AMSU-A2) and a four-channel Humidity Sounder for Brazil (HSB), provided by the Instituto Nacional de Pesquisas Espaciais (INPE), the Brazilian National Institute for Space Research. The AMSU and HSB are similar to instruments flying on satellites of the National Oceanic and Atmospheric Administration (NOAA) since May 1998, but when linked with the AIRS on Aqua, they become vital components of the most advanced sounding system ever flown in space: Aqua's AIRS/AMSU/HSB triplet.

The central purpose of the AIRS/AMSU/HSB combination is to obtain accurate atmospheric temperatures and humidities throughout the atmosphere, from the surface upward to an altitude of 40 km. The hope is that these temperatures and humidities, more accurate than any before obtained



HSB. (Photo courtesy of Brazil's Instituto Nacional de Pesquisas Espaciais.)

(AQUA Continued on page 5)

(AQUA Continued from page 4)



Aqua under development at TRW, with its Earth-observing instruments on board. (Photo by Sally Aristei/TRW.)

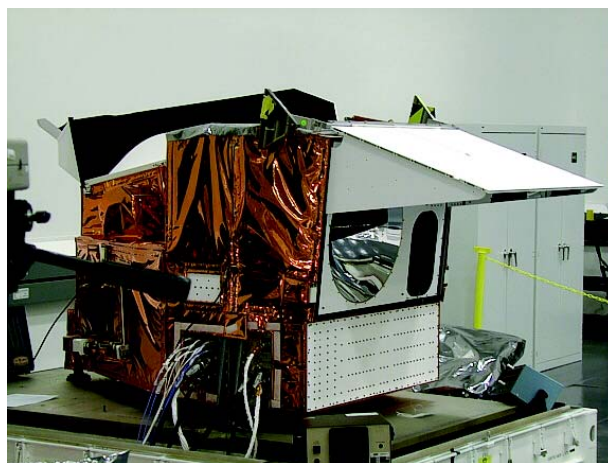
from space, will lead to improved weather forecasts, but will require getting the data very rapidly to weather forecasting agencies and having those agencies use these data as improved inputs to their numerical forecasting models. For these purposes, NASA is working very closely with NOAA, the key U.S. weather forecasting agency, and also with other weather forecasting agencies around the world.

Other key variables that will be examined with the AIRS/AMSU/HSB data include clouds, surface temperatures, and the following trace gases: ozone, carbon dioxide, carbon monoxide, and methane. The AIRS/AMSU/HSB science team, led by Moustafa Chahine at the Jet Propulsion Laboratory, will analyze these data to improve the understanding of global climate and particularly to (1) examine

whether the global water cycle is accelerating, (2) detect the effects of increasing greenhouse gases, and (3) determine connections between severe weather and climate change.

MODIS

The other three instruments on Aqua, outside of the AIRS/AMSU/HSB sounding suite, are the Moderate Resolution Imaging Spectroradiometer (MODIS), the Clouds and the Earth's Radiant Energy System (CERES), and the Advanced Microwave Scanning Radiometer for EOS (AMSR-E). MODIS and CERES instruments are also on Terra, launched in December 1999, and are provided by NASA, while AMSR-E is new and is provided by Japan's National Space Development Agency (NASDA).



MODIS. (Photo courtesy of Raytheon.)

MODIS is a 36-band cross-track scanning radiometer measuring visible and infrared wavelengths in the range 0.4-14.5 μm . MODIS provides the data with the highest spatial resolution of any of Aqua's instruments, at 250 m - 1 km, and is the one Aqua instrument whose science team, led by Vincent Salomonson of GSFC, has major aims for examining biological processes as well as physical processes in the global system. The MODIS Team is obtaining several indices of vegetation on land, plus quite a few life-related measurements in the oceans, in-

(AQUA Continued on page 10)



Technology Corner



Next generation of Ultra Low Power (ULP) Radiation Tolerant (RT) electronics to enable major advances in future mission capabilities

An initiative is underway to refine and apply ULP RT technology for complete flight electronic systems. This technology has the highest potential system level payoff of any NASA technology currently under development. A flight demonstration at the chip level will be accomplished on ST-5.

The electronics are being developed to operate at a supply voltage of 0.5 volts, compared to current flight electronics that operate at 3.3 or 5.0 volts. In active microelectronic circuits, power consumption is dominated by the dynamic voltage component, which is proportional to the square of the supply voltage. A 0.5-volt system will theoretically reduce dynamic power consumption by a factor of 100 at the chip level compared to a 5.0-volt system. The system level payoff was evaluated with a study of the system-level impact of re-engineering EO-1 and ST-5 to use ULP RT technology in all spacecraft bus electronics. These studies showed a reduction of more than 60% in flight system power and a corresponding reduction of more than 15% in flight system mass. The mass reduction is attributable to benefits such as reduced requirements for dissipating heat and for generating, storing and distributing power.

In addition to the power and mass reductions, ULP RT has excellent radiation characteristics, both tolerant and hard. ULP RT devices have been tested at Brookhaven National Laboratory (BNL) and have been shown to be Radiation Tolerant. (i.e. they do not latchup at radiation levels prescribed for the demonstration of radiation tolerance). It has also been demonstrated through testing at GSFC and the NRL that ULP RT devices have total dose hardness to at least 200 Krads, and may actually have the capability of meeting DoD total dose requirements, and of satisfying the deep space electronics requirements of NASA missions.

Cryogenic applications are a natural benefactor of ULP electronics. It has been demonstrated at GSFC that ULP electronics can operate at 15° K. This capability enables the design of electronics that operate in a very cold environment, such as a cold-side sensor data processor. Current industry low voltage efforts are still above 1 volt, are not radiation tolerant, and are closely held proprietary designs. In contrast, the NASA supported technology uses 0.5 volts, is radiation tolerant, and is fabricated using the CMOS process available in commercial foundries.

A detailed program plan is being developed that seeks long term funding from NASA Enterprises with a coordinating focus in Code R. Programs and Projects in formulation should soon have new enabling electronic hardware to apply on future missions.

John E. Oberright
Senior Systems Engineer
Systems Engineering Services and Advanced Concepts Branch, Code 531

Richard G. Schnurr Jr.
Assistant Chief for Technology
Electrical Systems Division, Code 560

Things You Should Know About

Code 400 Logo -



Logo

Code 400 Director Of Dolly Perkins recently told you all of the selection of a new directorate logo (please see below). As Dolly noted, it was a tough competition with Jim Chipouras, QSS/Code 480 emerging the winner. Thanks again to the judges who anguished over the final choice. The panel included: Bryant Cramer, David Jacintho, Grettchen Burton, Nancy White, Lisa Carroll, and Ron Moltiere.

Long Term Care -

You should apprise yourself of the information available about the Federal Long Term Care program, which is in the midst of an Open Season ending December 31, 2002. This is especially true if you are in your mid-50s, 60s, or beyond. Without arguing the merits for or against the need for this insurance, cost does go up each year, most noticeably from the mid-sixties on.

Of particular importance is the fact that active Federal employees, until the end of the Open Season, have to complete only an abbreviated form to be approved. Federal retirees on the other hand must complete a longer, more detailed application. Additionally, the unanticipated and unwanted addition of a 'medical condition', might very well make it more difficult, if not impossible, to be accepted into the program - should you wish to do so. It would behoove employees, again especially those from the mid-50s on, to at least become knowledgeable in the program prior to the expiration of the Open Season.

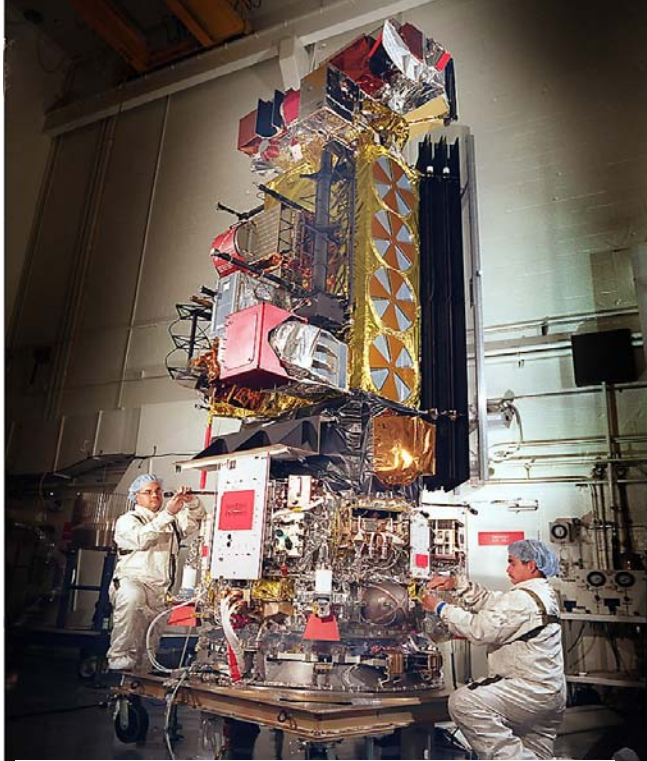
Save Those Pictures -



In our forthcoming November quarterly issue of The Critical Path, we will be telling you what you need to do to enter your pet in our third bi-annual Pet Contest. Once you submit your picture, our panel of judges will convene and announce their selections by the succeeding issue of The Critical Path in February 2003. Don't miss out on the details including prizes in November. We'll be looking for your entries as well as volunteers to be judges.

(NOAA-M Continued from page 1)

and Panametrics (Space Environment Monitor). The following were donated by the United Kingdom (Advanced Microwave Sounding Unit-B); Can-



POES Satellite In Cleanroom

ada (Search and Rescue Receiver), and France (Search and Rescue Repeater, Data Collection System). The launch vehicle was a refurbished Intercontinental Ballistic Missile that was built in the early 1960s.

NOAA-M was developed by the GSFC Polar Operational Environmental Satellites Program (POES), Code 480. The POES Program, fully funded by the National Oceanic and Atmospheric Administration (NOAA) in a cooperative NASA - NOAA arrangement, has successfully continued for more than 40 years.

The Tracking Data Relay Satellite System was used during ascent to acquire real time telemetry from

NOAA-M after the fairing was jettisoned. Separation from the Titan II, firing of the Apogee Kick Motor and all deployments of solar array, antennas, and sun shades were monitored as they occurred by the launch team at VAFB and the POES operations team at the Suitland, MD control center. Upon achieving orbit, NOAA-M was renamed NOAA-17. The first image, visible channels of the AVHRR, was taken the day of launch over the eastern United States.

The POES team is conducting a comprehensive 45-day post launch checkout of each NOAA-17 spacecraft subsystem and instrument. NASA retained operational responsibility for the new satellite for three weeks after launch and the POES Program provided around the clock presence at the NOAA satellite control center. On July 14, 2002, 21 days after launch, NOAA-17 was handed over to NOAA for operations. The POES team will finish verifying the performance of the science instruments in the remaining weeks of the checkout period. The results will be presented to NOAA in October 2002 and documented in a written report.

The first weeks in orbit of NOAA-17 went extremely well. All the instruments were activated as scheduled and are producing nominal data. The satellite is healthy. NOAA-17 is in a 833 kilometer circular, sun synchronous polar orbit with a descending 10:00 AM local solar time equatorial crossing. Its instruments measure every part of the Earth at least twice every day. Data from NOAA-17 will be input to NOAA computer models to generate medium and long-range weather forecasts.

NOAA-17 is more than a meteorological satellite, it is an environmental satellite that continuously measures the entire planet. Global data from NOAA-17 will be used for climate change research and to monitor the Earth's environment including sea surface temperatures, rainfall patterns, global cloud formations, vegetation patterns, snow/ice

(NOAA-M Continued on page 9)

(NOAA-M Continued from page 8)

coverage, Antarctic ozone hole, wild fire burning, global temperatures, atmospheric humidity, floods, hurricanes, aerosols, and solar flare detection. NOAA-17 also carries Search and Rescue instruments that detect emergency beacons set off by aviators, mariners, and others in distress. The beacon data is relayed to the ground so that rescue can be dispatched.

The POES team dedicated all of their work on NOAA-M to Harry McCain, the POES Program Manager who passed away on November 4, 2001. The team felt it was fitting that the name of the satellite was M, for McCain. In a moving tribute, the Air Force named the NOAA-M Titan II "Harry" in his honor.

There are two satellites left in the POES series, NOAA-N and NOAA-N Prime. These are planned for launch in June 2004 and March 2008 respectively. Afterwards, a new series of polar orbiting environmental satellites called National POES System, or NPOESS, will begin. NPOESS is a triagency program formed by the Department of Defense, NOAA and NASA.

Additional information about NOAA-M and the POES Program can be found at URL: <http://poes.gsfc.nasa.gov>. POES satellite data is available on the web at <http://www.noaa.gov>.

Karen Halterman
POES Project Manager/Code 480

NEBA Celebrates 50th Anniversary

The NASA Employees Benefit Association (NEBA), NASA's own group insurance program celebrated its 50th anniversary of service to NASA employees earlier this year.

Over the course of a half-century, more than \$75 million has been paid to the families of NEBA members. NEBA was "established for the sole purpose of providing low-cost group insurance to NACA (NASA) employees and conducts its business for the mutual benefit of its members and their beneficiaries and not for profit."

At the annual meeting of the NEBA Board of Directors in late May 2002, NEBA officials from the various Centers were faced with the news that our travel accident insurer was going to cancel the policy at the end of June, due to worldwide terrorist activity. As an alternative, the Board decided to increase the accidental death clause of the basic NEBA policy from double indemnity to triple indemnity. In this way most, and in some cases, more coverage would be provided in case of accidental death, while no additional premium would be charged NEBA members. Those members who only held travel accident policies were enabled by our carrier to join the NEBA basic plan until August 1, without the need for medical underwriting.

In another matter, the Board voted to send all members who had at least one year with NEBA (Basic plan) as of May 31, a fifth straight annual return of premium. Those eligible will receive checks by mid-September equivalent to premiums paid for basic and spouse for 12 pay periods.

NASA employees can join NEBA at any time. You may call any of the following officers at Greenbelt or Wallops for additional information and applications:

Greenbelt: Howard Ottenstein - President, x6-8583

Khrista White - Vice President, x6-8208

Mary Eileen Leszcz - Secretary, x6-8254

Wallops: Lisa Johnson - President, x7-1412

Evoralyn Thomas - Vice President, x7-1054

(AQUA Continued from page 5)

cluding coccolith concentration, chlorophyll fluorescence, pigment concentration, photosynthetically active radiation, and organic matter concentration. On the physical side, the MODIS Team is examining clouds, aerosols, temperature, water vapor, and ozone in the atmosphere, sea surface temperatures



The two CERES instruments. (Photo courtesy of TRW.)

and sea ice in the oceans, and land surface temperature, snow cover, and fire and burn scars on the land.

It is hoped that the Aqua MODIS measurements will benefit by this MODIS being the second MODIS in space, as the MODIS science team and MODIS manufacturer made several adjustments to the Aqua MODIS subsequent to the launch of Terra and analysis of the early Terra data. As a result of these adjustments, there should be less optical cross-talk and less electronic cross-talk amongst the Aqua MODIS bands, plus an improved radiative response versus scan-angle for the thermal emissive bands. There should also be improved sea surface temperatures, already state-of-the-art on the Terra MODIS, because of an adjustment made to Aqua bands 31 and 32, having them saturate at ap-

proximately 340 K rather than saturating at 400 K as for the Terra MODIS. The lower saturation temperature allows greater details for temperatures below 340 K, which includes all sea surface temperatures, although it loses all distinctions for temperatures above 340 K.

CERES

CERES is a three-channel radiometer measuring visible, infrared, and a small amount of ultraviolet radiation. Each channel measures a broad band of radiation carefully chosen for obtaining information about the Earth's energy budget. One channel measures shortwave radiation at 0.3-5 μm ; the second measures total radiation between 0.3 μm and over 100 μm ; and the third measures radiation in the 8-12 μm atmospheric "window." The shortwave radiation is predominantly radiation emitted by the sun that has traveled to the Earth/atmosphere system and then been reflected to the spacecraft. The longer wavelength radiation is instead predominantly emitted by the Earth/atmosphere system, with the radiation in the window band able to pass nearly unhindered from the surface and lower atmosphere to the satellite as long as the conditions are cloud-free and fairly dry. Like Terra, Aqua carries two CERES instruments, allowing one CERES to be operating in a cross-track scanning mode while the other scans with a rotating azimuth plane. This way, fluxes can be obtained from many differ-



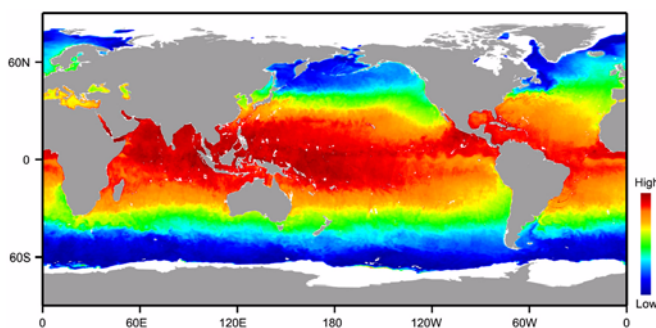
NASDA's AMSR-E after delivery to TRW. (Photo courtesy of NASDA.)

(AQUA Continued on page 11)

(AQUA Continued from page 10)

ent angles, thereby allowing appropriate corrections to be made for angular differences.

The CERES science team, led by Bruce Wielicki of Langley Research Center, is using the CERES data to determine the fluxes of radiative energy out of the Earth/atmosphere system and within the system. With the fluxes, they are examining the radia-



Global sea surface temperatures averaged for the three-day period June 2-4, 2002, as derived from data of NASDA's AMSR-E.
(Image courtesy of NASDA.)

tive forcing of climate and climate change, including radiative forcing from clouds. One of the key goals of the CERES team is a better understanding of the role of clouds in the global climate system. For this, they are combining MODIS data for cloud properties with CERES data for radiative fluxes. Through TRMM and Terra measurements, CERES team members have already (1) used CERES data to counter a hypothesis about thin cirrus clouds serving as an infrared "iris" (analogous to the iris of the human eye) exerting a negative feedback in the climate system and (2) found the tropical radiative energy budget to be much more dynamic and variable than it was earlier thought to be. Data from the Aqua CERES will allow them to expand upon those studies and many others.

AMSR-E

NASDA's AMSR-E is a 12-channel conically scanning radiometer measuring at microwave frequencies. It builds on the heritage of previous passive-microwave imagers but obtains data with finer spa-

tial resolutions, allowing more spatial details to be revealed. The success of the finer spatial resolution has been very apparent to scientists excitedly looking at the first AMSR-E images.

A huge advantage, for surface studies, of microwave imaging over visible and infrared imaging is that at many microwave wavelengths there is very little atmospheric interference modifying the signal between the surface and the spacecraft, so that surface data can be obtained even in the presence of a heavy cloud cover or dense haze. Also, since the microwave data are being emitted from the Earth/atmosphere system, there is no need for daylight in order to take measurements. Hence, sea surface temperatures, sea ice concentrations, snow cover extents, and other surface variables calculated with AMSR-E data can be obtained day or night, in any season, and under cloudy as well as cloud-free conditions. This is a substantial advantage for climate studies. On the other hand, the spatial resolution, although markedly improved over the resolution of previous passive-microwave imagers, is still coarse in comparison to the visible and infrared imaging of the MODIS instrument. Hence the MODIS and AMSR-E are nicely complementary for surface observations from the Aqua spacecraft, with the MODIS instrument getting detailed pictures under favorable atmospheric and lighting conditions and AMSR-E getting coarser resolution pictures under all lighting conditions and most atmospheric conditions.

There are two AMSR-E science teams, one in the U.S. led by Roy Spencer of the University of Alabama in Huntsville and the other in Japan led by Akira Shibata of the Japanese Meteorological Agency. The science teams have developed algorithms specifically for using the AMSR-E data to calculate rainfall, cloud water and water vapor over the oceans, sea surface temperature, sea surface wind speed, sea ice concentration and temperature, snow depth on sea ice, snow-water equivalent on land, and surface soil moisture. The soil moisture and surface temperature measurements are particularly exciting because they became possible through the inclusion on Aqua of channels

(AQUA Continued on page 15)

(TinTypes Phil Liebrecht Continued from page 3)

ence camp? Answer: go "Marsh Mucking", restore aquatic plants, study the various aquatic life of the Chesapeake Bay and have fun.).

Life outside of work:

Besides the time he invests in being a Dad and Husband, Phil enjoys woodworking, cooking (his cheesecakes are quite popular at MSP social functions), travel, music, home brewing, hiking, reading, gardening and tinkering with his 24 year old Volkswagen.

Life in the Mission Services Program:

With the Project Goddard reorganization of 1997 the management of most of the space operations work at GSFC was moved into the FP&P Directorate. The Mission Services Program was formed and tasked to outsource these services to industry to the maximum extent possible. Phil's management challenge was great as much of the work of the old MO&DS Directorate and a significant part of the old Suborbital Projects Directorate's work was transitioned into a project management structure with about a third of the staff. Add to this, the complexity of transitioning to the agency wide performance based space operations contract, continuing changes to the Agencies Space Operations program management structure and budget and a firm fixed price spacecraft development contract and he rarely has a dull moment. Phil especially enjoys working with the dedicated people of the MSP and contributing to their professional development. He actively participates in several educational outreach programs sponsored by the center and doesn't mind travel to the polar facilities required to support Earth and Space Science missions.

Life before the Mission Services Program:

Before joining the FP&P Directorate in late 1997 Phil was Chief of the Networks Division in the old Mission Operations and Data Systems Directorate. He spent his time there leading people involved with managing technology development, upgrades and operation of Space and Ground Network systems to support many NASA and other government missions. He also had extensive experience in integration and test of mission support ground systems. Some of his most memorable work experiences there include implementing and testing systems to measure the wind velocities on Venus as part of the Pioneer Venus Program, implementing Space Shuttle tracking and communications systems at Vandenberg Air Force Base in preparation for Shuttle launches, bringing the first (and second) TDRSS ground terminals to operational maturity with the Space Network and successfully integrating ground systems for many NASA and International missions. He came to NASA as a student intern after a high school friend told him it was a great place to work and was (and still is) captivated by the excitement of the space program.

(TinTypes Dorene Honycutt Continued from page 3)

parts of the US, to include CA, KS, NC, MD, VA over the past 20 years. I settled in this area to be close to my family.

That brings me to who I consider family, and I would ascertain that each person I have ever encountered on this journey called "life" is my family. Some of them, I laughed with, some I cried with, some I fought with, and some I love and loved with my whole heart. My children are amazing young adults now and I am truly blessed to see them grow into adulthood with honor and dignity. My stepchildren are wonderful human beings, very kind, loving and accepting. The love of my life, Terri, has shown me how truly blessed loving someone so openly and completely can be. She is the most incredible human being. I would invite you all to become a part of my family by coming into my life and enriching me with the "wholeness" of who you are.

My career:

My career has vastly changed over the years. What started out in college as a special education teacher, quickly evolved into a US Marine. After a brief stint in the Corps, I held various jobs, from meter maid to school crossing guard to clerk typist at a Title company to secretary at Cherry Point NC to working in a truck financing company before coming to Goddard.

My actual "career" here began as a clerk-typist in the Space Station Office, which was Code 400.6 (don't ask me how I remembered that). I worked with, and for, some extraordinary people. I was promoted to secretary and then, after about 2 years, moved over to the old Engineering Directorate as a secretary. After 9 months there, I was fortunate enough to get a STEP position as a Resources Analyst and worked in that position for 7 years before deciding that, although I had the aptitude for, and the talent for, being a number cruncher, I really enjoyed interaction with people.

I was given the opportunity to become the Administrative Officer here in April 1997 and absolutely love my job, enough so that I continue to commute 70 miles one way to come here. I love the people in the Directorate, the management and the sense of "family" I get with my co-workers. I want to be able to utilize my gifts and talents with people I work with because I truly care about all of you.

Thanks for allowing me to share who I am with you. What I want for you is to be true to yourself and stand in that truth, especially in the face of adversity. Definitely a tough thing to do, but worth it! So what will it take for you to step into your greatness?

“Cultural Tidbits”

Did you know ... that Indonesia’s national motto "Bhinneka tunggal Ika" roughly translates to "unity through diversity"? Indonesia is a nation of 13,677 islands, of which 6,044 are inhabited, situated across the equator between the continents of Asia and Australia and is the largest archipelago in the world.

Do you have a cultural tidbit to share? Send it to the Code 400 Diversity Council c/o Andrea Razzaghi @ andrea.i.razzaghi@gsfc.nasa.gov and we'll publish it in a future issue.

Andrea Razzaghi,/Code 424

Quotes of the Quarter



“Any intelligent fool can make things bigger and more complex. It takes a genius and a lot of courage to move in the opposite direction.”

— Albert Einstein —

“It was not so very long ago that people thought that semiconductors were part-time orchestra leaders and microchips were very small snack foods.”

— Geraldine Ferraro —

“Man is the best computer we can put aboard a spacecraft... and the only one that can be mass produced with unskilled labor.”

— Wernher von Braun —

“We act as though comfort and luxury were the chief requirements of life when all that we need to make us really happy is something to be enthusiastic about.”

— Charles Kingsley, a 19th century English poet/novelist/
clergyman Submitted by David K. Martin (Code 532/415) —



(What's New in the Directorate Continued from page 2)

LWS Missions in pre-formulation: Solar Dynamics Observatory (SDO) (entering formulation within the next month or two); Ionospheric Thermospheric Storm Probes (ISTP); Radiation Belt Storm Probes (RBSP); Heliospheric Sentinels; Space Environment Testbeds (SET).

Solar Terrestrial Relations Observatory (STEREO) Project, Code 463, Haydee Maldonado - Project Manager;

Solar-B, Larry Hill (MSFC)

Solar Dynamics Observatory (SDO) Project, Code 464, Ken Schwer - Project Manager.

Structure and Evolution of the Universe Program Office, Code 490. Dr. D. Bryant Cramer - Program Manager, and Dorothy Tiffany - Program Business Manager:

Gamma-ray Large Area Space Telescope Project (GLAST), Code 492, Liz Citrin - Project Manager.

Other 490 Projects in pre-formulation or formulation are:

Laser Interferometer Space Antenna Project, (LISA) Code 493; Constellation-X Project (CON-X), Code 494, Micro Arcsecond X-ray Imaging Mission, (MAXIM) Code 496; Orbiting Wide-angle Light Collectors Project, (OWL) Code 497; and the Energetic X-ray Imaging Survey Telescope Project (EXIST), Code 498.

The New Millennium Program office is now Code 490.1, Bryant Cramer, acting Program Manager.

Earth Observing Mission (EO-1), Code 491, Bryant Cramer, acting Project Manager.

Space Technology Mission (ST-5), Code 495, Doug McLennan, Project Manager.

Critical Path Social News

Births

Kim and Tim Brecker of Code 460, STP/LWS Program, had a baby girl Emily Rose, born on the 4th of July. Mother and daughter are doing well. Emily Rose is welcomed by her big sister, Abby.

Lisa and John Bartusek of Code 460, STP/LWS Program, had a baby girl Sylvie Frances, born on June 3. Mother and baby are doing well.

Wedding

Joseph Radich (Code 300/co-located to Code 425) and Marlene Dallas were married on Thursday, July 4, 2002. Congratulations to the newly weds.

Other

On July 24 a group from the Mission Services Program, Code 450, took off to attend a Baysox (the Orioles AA team) day game. A good time was had by all and the Baysox won 3-2. Some of the attendees included: Katlyn Synder, Karen Synder/ACS/450, Sarah Mc Carthy (daughter of Kevin Mc Carthy/450), Bob and Joan Walton/450, Al Levine/451, Korey Brown/Service Source/452, Dave Jacintho/451, Jim Bangerter/451, and Calvin Williams/Service Source/451.

(Aqua Continued from page 11)

at two frequencies (6.9 GHz and 10.65 GHz) that are lower than on currently operating satellite passive-microwave imagers. The AMSR-E data will also have applications to vegetation studies, although that has not been an emphasis of the science teams.

Early Data

All six Earth-observing instruments on Aqua (or seven, when counting the two CERES individually) are now operating and sending down high quality data. The first instrument to be turned on was the AMSU, on May 12, followed two days later by the HSB. Within days, the AIRS/AMSU/HSB science team had created first-light images from these data streams, mapping color-coded brightness temperatures (reflecting the radiation values received) for individual channels of data across the eastern U.S., the western U.S., and, for the HSB, Brazil. The next instrument to be turned on was NASDA's AMSR-E, with its data flow beginning on May 24. Some initial complications with the AMSR-E data were quickly solved by NASDA, who by June 1 had adjusted the automatic gain control (AGC), correcting the data flow. Days later NASDA created two global maps illustrative of the high quality data from the AMSR-E instrument, one map showing sea surface temperatures and the other showing a color-composite produced from three of the AMSR-E channels.

The AIRS visible data started flowing on May 26, and the AIRS infrared data started to flow on June 12. The CERES data started to flow on June 18, and the MODIS data started on June 24. In each case, very quickly after the instrument was turned on, the relevant science team had created first-light images illustrating the fact that the instrument is working and is obtaining high quality data. The MODIS team has indicated the clearly superior quality of the initial Aqua images versus the initial MODIS images from Terra, where there was an undesired striping; and the AIRS team, in addition to creating images, has plotted infrared spectra at individual points, establishing that every one of the 2378 infrared channels on AIRS is working.

NASA is putting out a sequence of press releases highlighting the first-light images from the Aqua instruments. The first press release came out on June 24, presenting the two first-light global images from NASDA's AMSR-E. This was followed by an image advisory on August 1 for two CERES images, a press release on August 6 for the AIRS/AMSU/HSB, and a planned press release on August 13, for MODIS.

Thanks

The Aqua project was run out of Code 422 under the able leadership of a sequence of three Project Managers: Marty Donohoe, George Morrow, and Phil Sabelhaus. Code 422 personnel worked tirelessly for over a decade to get this \$952 million mission launched and operating. They saw us through a contested award of the spacecraft contract; they saw us through the loss of two planned instruments from Europe and their replacement by the HSB contribution from Brazil and the AMSR-E contribution from Japan; they saw us through the successful development of all the final instruments and the spacecraft bus; and they saw us through all the complications arising late in the mission, from star tracker alignments to battery cells to complications in the data flow. Everyone who ever uses Aqua data is, knowingly or not, indebted to the extended Code 422 family and everything that they did to make this mission a success. Thank you Code 422. Thank you Phil. Thank you Boeing for the Delta rocket's flawless performance and TRW for a spacecraft that is operating spectacularly. Thank you BAE Systems, Aerojet, Matra Marconi Space and INPE, Mitsubishi Electric and NASDA, TRW, and Raytheon/Santa Barbara Remote Sensing for the AIRS, AMSU, HSB, AMSR-E, CERES, and MODIS instruments, respectively. And thank you everyone in mission operations and in every aspect of the data flow and data handling. This mission required all of you, and you are all appreciated.

Claire L. Parkinson/Aqua Project Scientist/
Code 971



FUTURE LAUNCHES CALENDAR YEAR 2002

GALEX	OCT
TDRS J	NOV
SORCE	NOV
INTEGRAL	DEC
CHIPS	DEC
ICESAT	DEC

ATTENTION INTERNET BROWSERS:



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If you have a story idea, news item, or letter for The Critical Path, please let us know about it. Send your note to Howard Ottenstein via Email: hottenst@pop400.gsfc.nasa.gov, Mail: Code 403, or Phone: 6-8583. Don't forget to include your name and telephone number. Deadline for the next issue is October 31, 2002.